ature of 40° F., would add 2° F. to the temperature over an area of 326 square miles to a height of 1 mile. This could only be true when there was no movement of the atmosphere, a condition that only occasionally prevails; and the effects of the heating would be more marked in winter than in summer. Evidently some other influence also has a part in modifying the minimum temperatures of cities.

Table 6 shows that in cities the minimum temperature excess is more pronounced on days when dense smoke prevails. We are therefore justified in attributing a part of the excess in the monthly mean minimum temperature of cities to the general smokiness of their atmospheres.

TABLE 6.—*Departures of the maximum and minimum temperature and the range of temperature in cities, when smoke or fog was dense, from the corresponding averages at surrounding stations.*

| Station. | Maximum. | Minimum. | Range. |
|---|---|---|---|
| | ° F. | ° F. | ° F. |
| Pittsburgh | −0.9 | +6.5 | −7.4 |
| Philadelphia | −0.4 | +6.9 | −7.3 |

Table 6 also shows that the maximum temperatures are not affected to the same extent as the minimum temperatures. This is because the smoke is densest during the morning hours, the convection of midday helping to carry it away. At the same time the more thorough mixture of city and country air tends to equalize temperatures over the two regions, and it may also be that the absorption of heat by the smoke particles tends to increase the maximum temperatures.

Williamsport, Pa., is a small city in which the effects of city heating must be slight; and since the thermometers have had exposures similar to those at surrounding stations, namely, in a shelter a few feet above the ground, the only known reason why the minimum temperature should show the excess revealed by Table 5 is the influence of the smoke cloud, which is quite dense at times owing to the extensive use of bituminous coal for manufacturing purposes.

Between December, 1912, and May, 1913, inclusive, temperature readings were obtained from thermometers exposed a few feet above the sod in a park in Allegheny, Pa., just across the river from the Weather Bureau office in Pittsburgh, and from thermometers similarly exposed at Sewickley, Pa. The results, which are summarized in Table 7 show rather small differences between the readings at Allegheny and the Weather Bureau office in Pittsburgh, but differences between the readings at Allegheny and Sewickley of about the magnitude that would be expected from the comparisons summarized in Table 5.

Other conditions being equal, the diurnal range of temperature should be proportional to the amount of heat received during the day; but, as already stated, it seems probable that in the cases under consideration the diminished diurnal range of temperature is due principally to retardation of nocturnal cooling by the smoke cloud over the cities.

TABLE 7.—*Differences between temperatures in Pittsburgh and its suburbs.*

| Stations. | Maximum. | Minimum. | Range. |
|---|---|---|---|
| | ° F. | ° F. | ° F |
| Allegheny—Weather Bureau, Pittsburgh | +0.8 | −0.3 | +1.1 |
| Allegheny—Sewickley | −0.1 | +3.3 | −3.4 |
| Sewickley—Weather Bureau, Pittsburgh | +0.9 | −3.6 | +4.5 |

I am indebted to Mr. George S. Bliss, section director, United States Weather Bureau, in charge of the Pennsylvania section, for the data for Philadelphia, Williamsport, and Harrisburg, and for information relative to conditions prevailing at these stations.

## SUMMARY.

1. City fogs are more persistent than country fogs, principally because of their increased density on account of the smoke that accumulates in them.

2. In consequence of the above there are fewer hours of sunshine in cities than in the country.

3. In the clear part of the day in winter in London the average limit of visibility does not exceed one-half mile. In Pittsburgh it averages about 1½ miles. This latter is less than one-tenth the average limit of visibility in the open country about Pittsburgh.

4. The chemical action of light in smoky cities has been found to be 40 per cent less than in the open country, and over 20 per cent less on smoky days than on comparatively clear days.

5. Minimum temperatures are markedly higher in cities than in the country, partly on account of city heating, but principally because the smoke acts as a blanket to prevent the escape of heat at night.

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## NEW DAILY WEATHER MAP.

The daily weather map of the Northern Hemisphere now being published by the United States Weather Bureau, is likely to become invaluable to all who are actively interested in the study of the free atmosphere, as distinguished from the study of the air near the earth's surface that directly belongs to agriculture and climatology.

The edition presents both the second edition of the regular 8 a. m. map of the United States and, on the reverse, the daily map of the Northern Hemisphere. It is limited to a few hundred copies and is sent to libraries, meteorological offices, and a few special meteorological students. Copies are dispatched either daily (folded), or in weekly rolls, or in monthly rolls, by mail or through the International Exchange Service of the Smithsonian Institution, according as requested by the respective recipients. Copies are also to be purchased through the United States superintendent of public documents at $3 per year or 30 cents per month. The following letter accompanied the first issue:

### WEATHER MAP OF THE NORTHERN HEMISPHERE.

On January 1, 1914, the United States Weather Bureau began the publication at Washington of a weather map of the Northern Hemisphere, a copy of which accompanies this announcement. Hereafter this map will be printed on the reverse side of the morning weather map of the United States. A similar manuscript map of the Northern Hemisphere has been prepared daily for several past years in the Weather Bureau, and has proved of great value to the forecasters in predicting general changes of the weather, and especially in extending the periods for which such forecasts can be successfully made. Although the number of reports available for the construction of the map is limited at present, and the times of obeservation are not all strictly simultaneous, nevertheless the essential features of the atmospheric circulation over the Northern Hemisphere are fairly well depicted.

In beginning this important publication it seemed advisable not to retain the arbitrary and irrational units ordinarily employed for measuring pressure and temperature of the atmosphere, but to adopt the more scientific and rational units of the C. G. S. system. Accordingly, the reported pressures are all expressed in dynamic units in which a pressure of 750.06 mm. of mercury corresponds to a force of 1,000,000 dynes. Following the suggestion of Bjerknes, this absolute unit of pressure is called 1 bar=1,000 millibars. The reported temperatures have all been reduced to the absolute scale (Centigrade) on which the temperature of melting ice is 273°.

Mathematical and dynamic studies of the motions of the atmosphere are possible only when the data are given in rational units of the kind described. It is hoped the publication of this map of the Northern Hemisphere will facilitate and promote the serious scientific study of the great and complex problems of the general circulation of the atmosphere.

C. F. MARVIN, *Chief of Bureau.*

This new daily weather map of the Northern Hemisphere has received general commendation both in Europe and America. The world's progress in telegraphy has thus made possible this modification of the ideas carried out by Gen. A. J. Myer in 1872 in his "International Bulletin of Simultaneous Meteorological Observations." That bulletin was dropped in 1889 by the Chief Signal Officer, presumably because of expense. It was revived in different form as a part of the marine meteorological work of this bureau in 1894; its map has been maintained in manuscript as a part of the forecast work since 1895. Prof. C. F. Marvin has returned to the original polar projection (Postel-Werner) and the map is now published daily by lithography as nearly as possible in agreement with the ideas of all prominent students of the free atmosphere. We quote a few acknowledgments:

**Bjerknes,** Leipzig, January 29, 1914:

I have been pleased to see the publication of your daily weather map for the Northern Hemisphere. The introduction of the C. G. S. units is a very great progress indeed.

**Gold,** London:

I must write to congratulate you on the energetic way in which you have tackled the question of units and on the beautiful Northern Hemisphere charts in millibars and absolute degrees, of which you have sent me a copy. * * * You will probably see that absolute units have also been used from January 1 for the daily charts which are issued with the Weekly Weather Report.

**Hergesell,** Strassburg:

I have received with much interest the first weather map of the Northern Hemisphere. * * * Precisely in the work of the International Commission for Scientific Aeronautics, this map will be a great help and a great advantage. I believe that all problems of general meteorology, which embrace, not local studies but the great problems of the general circulation, will receive a great encouragement from this publication.

**Wilfred M. Wilson,** Ithaca, N. Y., professor of meteorology:

I beg to offer my congratulations on this important advance which, I feel sure, will tend toward the realization of the hope expressed in the last paragraph of your memorandum, as to the "serious scientific study of the great and complex problems of the general circulation of the atmosphere."

**Charles Stewart,** Spokane, Wash., local forecaster:

The map of the Northern Hemisphere supplies a long-felt want. It is of great value for forecast studies and its daily publication will be gladly welcomed.

**Dr. W. Köppen,** Hamburg, January 22, 1914:

With great interest and delight I have to-day received the new daily weather map for January 1, 1914, with the weather map of the Northern Hemisphere. The transition to the millibars was a delightful surprise. In reference to the isotherms I would urge that they be drawn for the absolute temperatures 268°, 273°, 278°, 283°, etc., instead of for 270°, 275°, etc.

It is also desirable to accentuate the isotherm of 273° by a thicker line in order to bring the frost region of winter into prominence.